IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	**Confirmation No. 9516**
Norio KIMURA et al.	:	Attorney Docket No. 2003-0865
Serial No. 10/601,789	:	Group Art Unit 3723
Filed June 24, 2003	:	Examiner Hadi Shakeri
APPARATUS FOR POLISHING A SUBSTRATE	:	**MAIL STOP: AF**

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
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Sir:

I, Yu ISHII, being the inventor, jointly with Norio KIMURA, Hirokuni HIYAMA, Katsuya OKUMURA and Hiroyuki YANO, of U.S. Patent Application 10/601,789, as identified above, here declare the following:

1. Our above-referenced application includes three independent claims, claims 44, 49 and 50, which all include the following limitation:

> an attitude control mechanism for keeping said lower surface of said substrate carrier parallel with said polishing surface, said attitude control mechanism being operable to calculate a force applied to said substrate carrier based on a rotational moment and a direction of frictional force acting on said substrate carrier and a contact area where the substrate contracts said polishing surface

2. The above claim limitation is supported by the discussion in our specification beginning in section 73 on page 18 of the original specification, continuing through section 81 on

page 21. Reference is made herein to Figs. 14-16. As discussed in this section, with the attitude control mechanism of the present invention, as described in section 75, friction sensors sense an X-directional component and a Y-directional component of force applied to a substrate from a polishing surface under friction generated between the substrate and the polishing surface. The sensors supply output signals representing force components to an arithmetic and control device as shown in Fig. 16. This device also receives a signal presenting an area of a substrate W in contact with the polishing surface, calculated on the basis of a distance between a center of the substrate and the center of the polishing surface. As described in section 77, a turntable is rotated at a predetermined speed and the substrate carrier body is urged against the polishing surface under a pressing force, and thus the substrate carrier body is subject to a rotational moment M caused by the friction force generated between the substrate and the polishing surface. As a result the substrate carrier body is inclined. Due to the rotational moment, pressure between the surface of the substrate and the polishing surface becomes uneven; the arithmetic control unit is used to compute forces to cancel the rotational moment M on the basis of the outputs of the friction force sensors. Noting section 78 and Fig. 16, a computing unit 90-1 of the arithmetic and control device determines a direction θ of the frictional force and the rotational moment M on the basis of the outputs of the friction force sensors, taking into consideration the contact area. This is used to compute forces for actuators applying force through pressing members to be applied to the substrate carrier.

3. Accordingly, it is readily seen that the claimed attitude control mechanism is operable to calculate a force applied to the substrate carrier based on the rotational moment and the direction of frictional force acting on the substrate carrier, as well as the contact area where the substrate contacts the polishing surface. This is not the way in which the Watanabe patent operates.

4. The Watanabe patent, in a first embodiment, detects displacements in X, Y and Z axes and tilt angles with respect to X and Y axes to control the attitude of the top ring and the polishing surface pressure. Note column 6, lines 34-39, for example. The pressing force F to be

applied to the carrier or to the top ring is calculated based upon an equation $F = KI$ where K is a coefficient and I is the amount of current going through thrust coils 21a and 21b, noting column 7, line 56. The calculated pressing force is used to control the polishing surface pressure in an allowable range.

5. In a second embodiment of Watanabe, contact pressure that is applied on the polishing surface is calculated based on the equation $P = dS/2(r^2-x^2)^{1/2}$ (where d is a constant, S a pressing force, of x-y table) (twelfth column, line 23).

6. Further, it may be seen that Watanabe employs radial sensors 18 and 19 and a thrust sensor 17. However, each of these sensors is a displacement sensor, detecting displacement of the rotation shaft 12 in the vertical and horizontal directions. Thus, it is by observing actual displacement of the shaft 12 through which displacement values are obtained (noting again column 6) and through which the X, Y and Z, and tilt angle, displacements are obtained.

7. Thus, Watanabe uses the actual displacement of the shaft. Watanabe does not calculate the force that is applied to the substrate based upon a rotational moment and a direction of frictional force that is acting on the substrate carrier. Nor is there a consideration of the contact area where the substrate contacts the polishing surface.

8. The Examiner cited the first several lines of column 2 in Watanabe in support for the rejection. However, this portion is background to the invention of Watanabe, and discusses the fact that friction force acting at the polishing surface generates a rotational moment M, which produces tilting of the top ring 3. However, this portion of Watanabe is recognizing the cause of the tilting phenomenon. The solution of Watanabe is to employ the displacement sensors described above. The solution of Watanabe is not to calculate the force that is to be applied to the substrate carrier based on the rotational moment or the direction force, or the contact area where the substrate contracts the polishing surface. In other words, while Watanabe does recognize that the tilting phenomenon is due to the force of friction and the rotational moment generated,

Watanabe addresses this issue by basing adjustments on different information than the present invention; Watanabe employs sensors detecting the actual displacement of the shaft, while the present invention calculates the force based upon the rotational moment and the direction of frictional force acting on the substrate carrier, as well as the contact area.

9. I further declare that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

May 7, 2007
Date

Yu ISHII